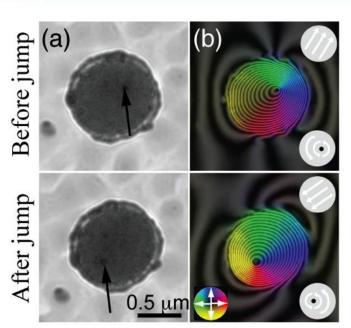
Anomalous Vortex Behavior in Coupled Permalloy Discs



- (a) Under-focus Lorentz TEM image showing the position of the vortex core before and after jump,
- (b) Experimental magnetic induction map showing the direction of magnetization and the stray fields that arise from the discs (color wheel indicates magnetization direction). The inset schematics shos the orientation of magnetization in the pinned layer (top) and the free layer (bottom).

Scientific Achievement

Visualization and control of magnetic spin configuration in patterned heterostructures

Significance and Impact

Fundamental understanding of competing energy terms that govern the spin texture and domain behavior in nanomagnetic systems

Research Details

- -The nanoscale magnetization behavior in exchange coupled Permalloy discs with 20 nm thickness was analyzed using in-situ aberration-corrected Lorentz transmission electron microscopy
- —In combination with modeling, we showed that the anomalous vortex behavior in the free layer is controlled by the demagnetizing energy of the pinned layer (≈ $9.6 \times 10^{-2} \text{ erg/cm}^2$), which dominates over the exchange coupling (≈ $9.6 \times 10^{-3} \text{ erg/cm}^2$) and shape anisotropy energy (≈ 0).

[1] S. Zhang, A. K. Petford-Long, O. Heinonen, and C. Phatak, Appl. Phys. Lett. 105, 212409 (2014).

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